Improving Inventory Management at Lutron Electronics to Enhance Production Efficiency and Reduce Costs

Alanis S. Reyna Concepcion
Advisor: Héctor J. Cruzado, PhD, PE
Graduate School

Abstract

This project was carried out at Lutron Electronics, a company specializing in lighting control systems, where production efficiency was being affected by inventory inaccuracies, material shortages, and limited forecasting capabilities. The project addressed the problem of ineffective inventory management, which contributed to increased operational costs and delayed production schedules. The main objective was to optimize inventory practices to achieve 98% inventory accuracy, ensure material availability, and increase production output by 15–20% over six months. The methodology involved assessing current inventory processes, adjusting recorder point parameters, implementing automated stock alerts, standardizing inventory reporting, and piloting demand forecasting tools. Data collection and weekly performance monitoring were used to measure progress. Over six weeks, material availability improved from 72% to 89%, supported by improved internal transfers and faster supplier response. The project concluded with a structured management strategy and stronger cross-functional alignment. The concrete contribution was the development and implementation of a scalable, system-driven inventory improvement model.

Introduction

Efficient inventory management is one of the most important factors in ensuring smooth and efficient production processes, reducing costs, and maintaining high levels of customer satisfaction. Facing significant challenges related to inventory imbalances, particularly raw material shortages and overstocking could lead a manufacturing plant to be unreliable. These issues can cause production delays, high operational costs, and decreased overall efficiency, negatively impacting a company's ability to meet customer demands and remain competitive in the market.

Lutron Electronics, Inc. is an American company specializing in lighting control systems, automated shading solutions, and energy management technologies. Lutron invented the solid-state dimmer, revolutionizing lighting control in residential and commercial spaces. Lutron maintains a global presence with numerous offices and facilities, including one of the key locations in Humacao, Puerto Rico.

Raw material shortages with Lutron Electronics, Inc. occur due to various factors, including supply chain disruptions, inaccurate demand forecasting, system set up issues and ineffective procurement strategies. When materials do not arrive on time or become unavailable because of quality issues, production schedules are disrupted, leading to idle time, lost revenue, and missed demand deadlines. On the other hand, overstocking raw materials leads to working capital, increases storage costs, and raises the risk of material obsolescence. Without a well-structured inventory management system, manufacturing plants struggle to balance the fine line between having enough raw materials to meet production demands and avoiding unnecessary excess.

The objectives of this project were to:

- Achieve and maintain at least 98% inventory accuracy by implementing regular cycle counting and audits.
- Improve material availability rate to 98% to ensure uninterrupted production schedules.
- Improve the reliability of meeting production demand and increase production output by 15-20% within 6 months by reducing material shortages through improved inventory planning.

Literature review

Material shortages and inefficient inventory management continue to pose significant challenges in manufacturing, often leading to production delays, cost increases, and disruptions across the supply chain [1]. Developing effective mitigation strategies requires a careful balance of inventory levels, time buffers, and supplier flexibility [1]. Research highlights that the use of automated tracking systems and predictive analytics can support optimal stock levels, thereby improving operational efficiency and reducing dependence on reactive procurement practices [2].

Strategic procurement and cross-functional coordination, particularly among procurement, logistics, and production planning, are also critical in minimizing inefficiencies. A lack of communication between these departments can result in backorders, excessive overtime, compressed production schedules, and unexpected bottlenecks on the shop floor [3].

Although material shortages have eased in certain sectors, industries reliant on computing and energy-related components continue to face persistent constraints. These ongoing challenges are influenced by external factors such as volatile supply conditions, geopolitical tensions, and increasing competition for key resources [4].

Predictive analytics has gained traction as a powerful tool in inventory management, enabling manufacturers to forecast material shortages before they affect production. By leveraging historical data and market trends, organizations can implement proactive strategies to stabilize supply chains and minimize financial risks [2, 4]. In addition, successful adoption of advanced inventory management technologies depends on effective change management and organizational readiness [5].

Methodology

To improve material flow and production efficiency, a structured approach was implemented using Lean Manufacturing, Six Sigma, and risk management strategies. The process began with an assessment of existing inefficiencies, utilizing Value Stream Mapping to identify bottlenecks and optimize supply chain flow. Just-in-Time principles ensured steady material availability, while the 5S methodology enhanced inventory organization.

The DMAIC framework from Six Sigma systematically defined, measured, analyzed, improved, and controlled production inefficiencies, focusing on reducing lead times and eliminating waste. Lean Six Sigma techniques such as FIFO stock rotation and demand-driven inventory systems were used to minimize obsolete stock and lower storage costs. Additionally, Earned Value Management was applied to track inventory cost performance, ensuring financial efficiency.

To strengthen resilience, risk management strategies were integrated to address supplier disruptions and material shortages proactively. Continuous monitoring, standardized reporting, and employee training sustained improvements, ultimately optimizing operational efficiency and reducing unnecessary costs.

Results

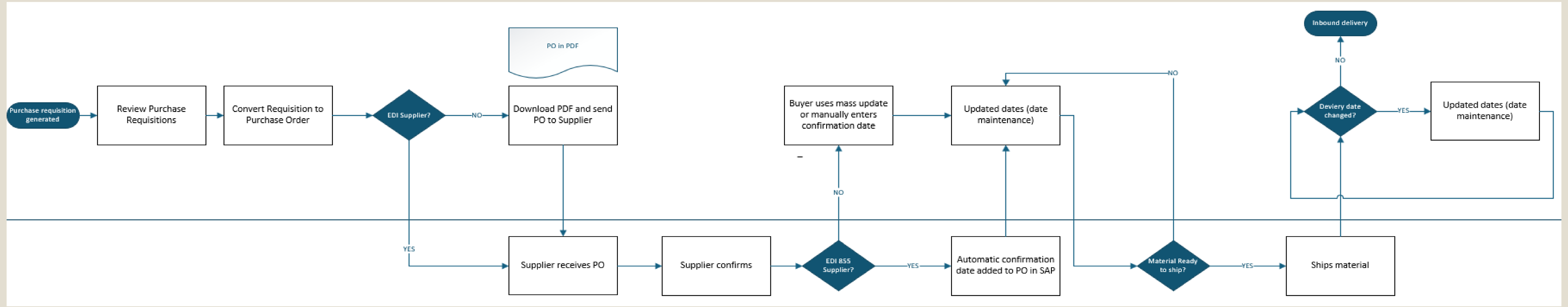

Figure 1. Purchasing current process

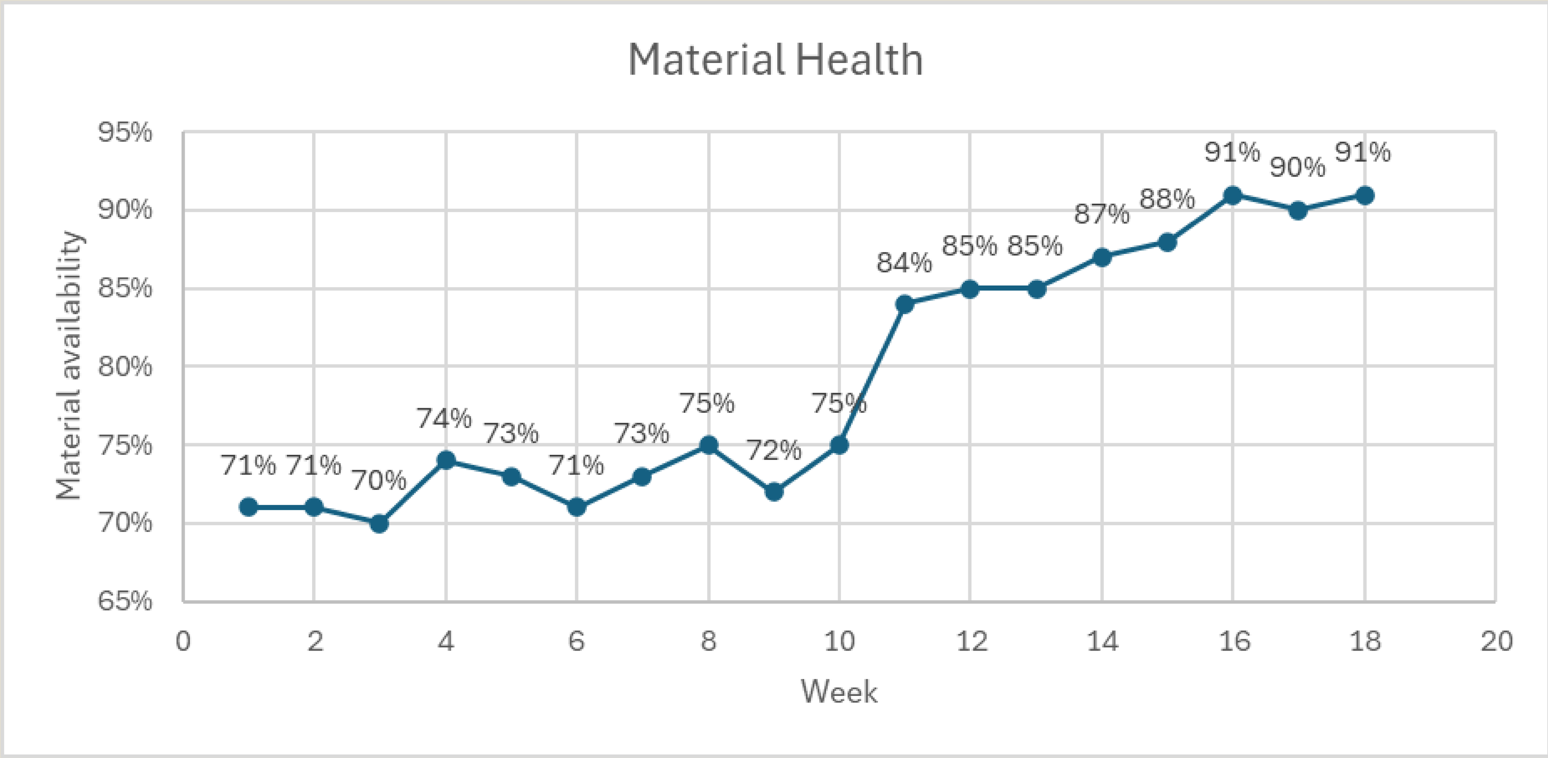

Figure 2. Material health

Following the implementation of the inventory management strategies at Lutron Electronics, an eight-week performance monitoring phase was conducted to assess their effectiveness. The key indicators tracked were inventory accuracy, material availability, and system responsiveness. The most notable improvement was in material availability, which increased steadily from 72% to 89%. This represents a 17-percentage-point gain, bringing the company closer to the project's target of 98% and signaling a significant reduction in material shortages that had previously disrupted production.

This improvement translated to more reliable production schedules, reduced idle time on the manufacturing floor, and fewer emergency procurement activities. The gains were directly attributed to several key interventions: the adjustment of reorder point parameters, enhanced coordination with local suppliers, improved internal transfers between workstations, and the adoption of automated stock alerts. These changes led to greater trust in system-generated data and allowed for proactive rather than reactive decision-making.

Conclusion

Material shortages and ineffective inventory management continue to disrupt manufacturing operations, highlighting the need for strategic, data-driven approaches to planning, purchasing and coordination. This project has shown that predictive analytics, when integrated with clear inventory planning and strong cross-functional communication, can significantly improve a company's ability to anticipate and respond to supply chain problems. The literature reviewed emphasizes that addressing these challenges requires not only technological adoption but also effective change management to ensure successful implementation. By aligning procurement, logistics, and production planning, manufacturers can reduce inefficiencies, minimize costly delays, and build greater resilience in their operations.

To build on these insights, organizations are encouraged to invest in predictive planning tools that incorporate real-time data, enhance collaboration between departments, and regularly evaluate supplier performance. Future efforts should also focus on employee training, change readiness, and continuous improvement processes to ensure long-term success.

References

[1] Panos Kouvelis, Xingxin Chen and Yu Xia. (August 2023). Managing material shortages in project supply chains: Inventories, time buffers, and supplier flexibility.

[2] Richard L. Pinkerton, Ph.D., C.P.M., Chair, Marketing and Logistics, Sid Craig School of Business, California State University, Fresno, California, and Kathleen A. Petitis, Purchasing Supervisor, ILC Technology, Inc., Sunnyvale, California (2012).

[3] Jason Miller (January 2025). Raw material shortages have abated, but some lingering issues remain. Industries affected by increased demand for computing power and electricity continue to see shortages.

[4] Dr. S.S. Jadhav and Jai Prakash (June 2024). Impact of Shortage of Raw Materials on the Manufacturing Process in the Automobile Industry. Universal Research Reports 11(2):218-223.

[5] Annette Harris (September 2024). Supply Chain Shortages and Their Impact on Manufacturing.